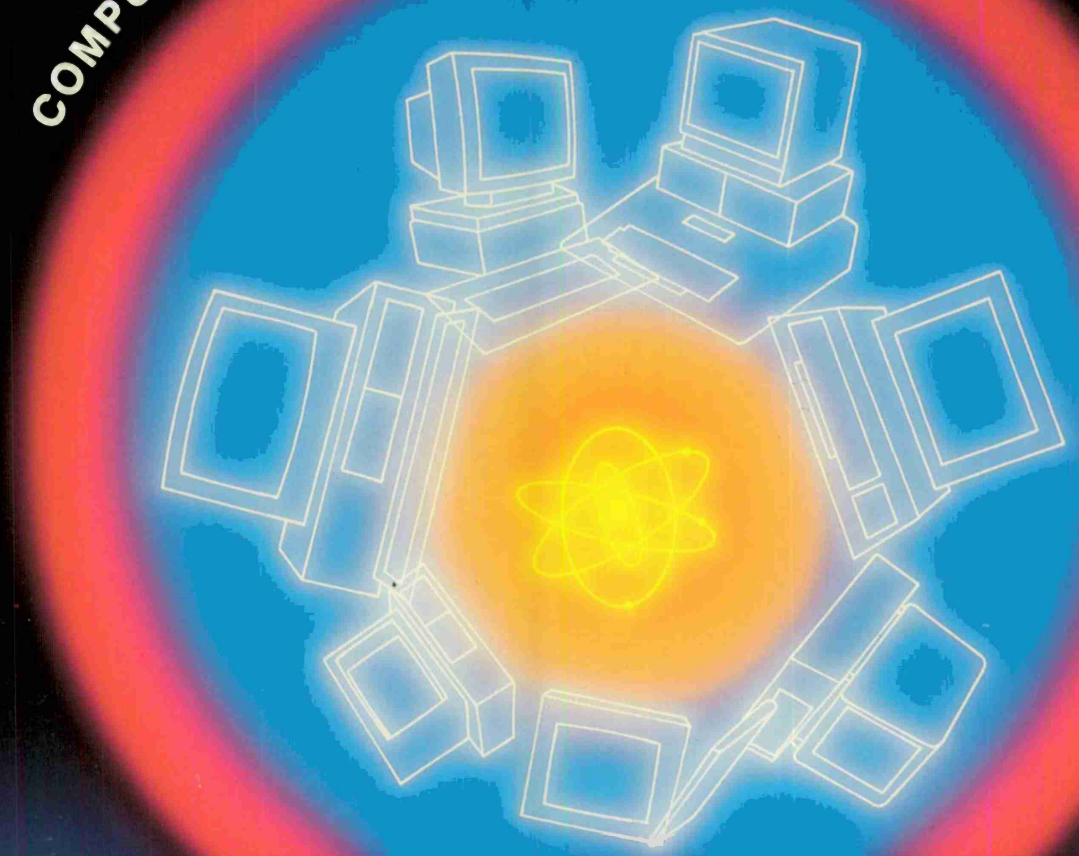
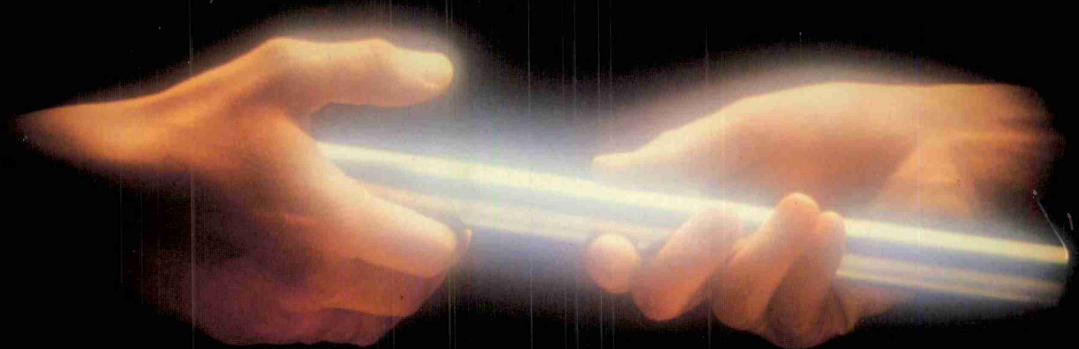
ESD-TR-86-284

COMPUTER RESOURCE MANAGEMENT TECHNOLOGY



PE 64740F



Approved for public release; distribution unlimited.

REVIEW AND APPROVAL

This brochure has been reviewed and is approved for publication.

ARTHUR G. DECELLES, Major, USAF
Program Manager, Computer Resource
Management Technology

FOR THE COMMANDER

ROBERT J. KENT
Director, Software Design Center
Deputy for Development Plans
and Support Systems

Photo Cover: Michael Radencich Illustration/Design: Irene Elios

UNCLASSIFIED
SECURITY CLASSIFICATION OF THIS PAGE

REPORT DOCUMENTATION PAGE

1a. REPORT SECURITY CLASSIFICATION Unclassified	1b. RESTRICTIVE MARKINGS None
2a. SECURITY CLASSIFICATION AUTHORITY	3. DISTRIBUTION / AVAILABILITY OF REPORT Approved for public release; distribution unlimited.
2b. DECLASSIFICATION / DOWNGRADING SCHEDULE	
4. PERFORMING ORGANIZATION REPORT NUMBER(S) ESD-TR-86-284	5. MONITORING ORGANIZATION REPORT NUMBER(S)
6a. NAME OF PERFORMING ORGANIZATION HH Aerospace Design Co. Inc. 6b. OFFICE SYMBOL (*If applicable*)	7a. NAME OF MONITORING ORGANIZATION Deputy for Development Plans and Support Systems
6c. ADDRESS (*City, State, and ZIP Code*) Civil Air Terminal Bedford, MA 01730	7b. ADDRESS (*City, State, and ZIP Code*)
8a. NAME OF FUNDING / SPONSORING ORGANIZATION 8b. OFFICE SYMBOL (*If applicable*) XRS	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER F19628-86-C-0090
8c. ADDRESS (*City, State, and ZIP Code*) Electronic Systems Division, AFSC Hanscom AFB, MA 01731-5000	10. SOURCE OF FUNDING NUMBERS PROGRAM ELEMENT NO. 64740F; PROJECT NO. 2524; TASK NO.; WORK UNIT ACCESSION NO.

11. TITLE (*Include Security Classification*)
COMPUTER RESOURCE MANAGEMENT TECHNOLOGY

12. PERSONAL AUTHOR(S)
McCormack, Thomas H.; Loyal, Michael A.; Elios, Irene (art work).

13a. TYPE OF REPORT	13b. TIME COVERED	14. DATE OF REPORT (*Year, Month, Day*)	15. PAGE COUNT
Final	FROM _____ TO _____	1986 December	12

16. SUPPLEMENTARY NOTATION

17. COSATI CODES			18. SUBJECT TERMS (*Continue on reverse if necessary and identify by block number*)
FIELD	GROUP	SUB-GROUP	Technology Transition; System Acquisition; Engineering Development; Computer Security; Mission Critical Computer Resources; Software Engineering

19. ABSTRACT (*Continue on reverse if necessary and identify by block number*)

The Computer Resource Management Technology Program (PE 64740F) is the sole Air Force engineering development program to focus on the problems associated with the acquisition, development, and support of computer resources within mission critical Air Force weapon systems. Engineering development is the final development and test of an operationally, technically, and economically desirable product. Mission critical systems are the airborne; spaceborne; command, control, communications and intelligence; and armament systems directly involved in the planning and execution of military missions. As the primary Air Force vehicle for transitioning the computer technology of advanced development work accomplished in industry, universities, and laboratories, the program's five continuing projects target the development and initial application of products which reduce software life cycle cost, enhance acquisition management control, and improve the quality and security of weapon system software.

20. DISTRIBUTION / AVAILABILITY OF ABSTRACT	21. ABSTRACT SECURITY CLASSIFICATION	
☐ UNCLASSIFIED/UNLIMITED ☒ SAME AS RPT. ☐ DTIC USERS	Unclassified	
22a. NAME OF RESPONSIBLE INDIVIDUAL Arthur G. Decelles, Major, USAF	22b. TELEPHONE (*Include Area Code*) (617) 377-2106	22c. OFFICE SYMBOL ESD/XRS-1

DD FORM 1473, 84 MAR — 83 APR edition may be used until exhausted. All other editions are obsolete.

SECURITY CLASSIFICATION OF THIS PAGE
UNCLASSIFIED

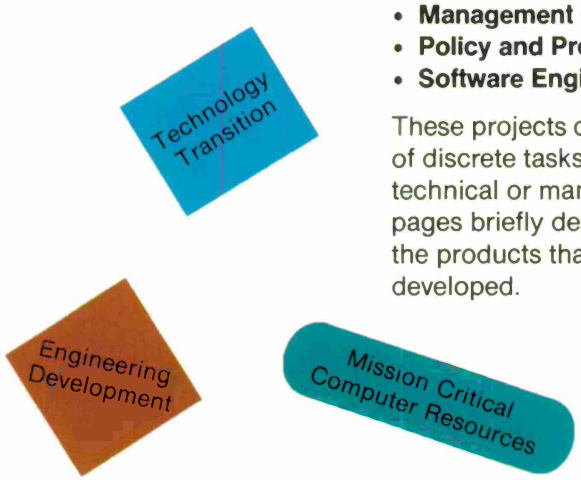
INTRODUCTION

This document provides an introduction and overview of the U.S. Air Force's **Computer Resource Management Technology Program** (Program Element 64740F) and each of its five projects. This continuing engineering development program is established to address the many, varied problems associated with the acquisition, development, and support of Mission Critical Computer Resources (MCCR) within Air Force weapon systems. Mission critical systems are the spaceborne; airborne; command, control, communications and intelligence; and armament systems directly involved in the planning and execution of military missions.

The program's goal is to apply technology to the system acquisition and support process, to reduce software life cycle cost, and to improve the quality of weapon system software. Specifically, this program emphasizes the transition of advanced computer technology from laboratories, industry, and academia into operational use through an engineering development effort.

To achieve these objectives, the program has been structured into five distinct projects:

- **Computer Security**
- **Requirements Analysis**
- **Management Control Technology**
- **Policy and Procedure Guidance**
- **Software Engineering Tools & Methods.**



These projects collectively encompass a number of discrete tasks, each one addressing a specific technical or management issue. The following pages briefly describe each of these projects, and the products that have been or are being developed.

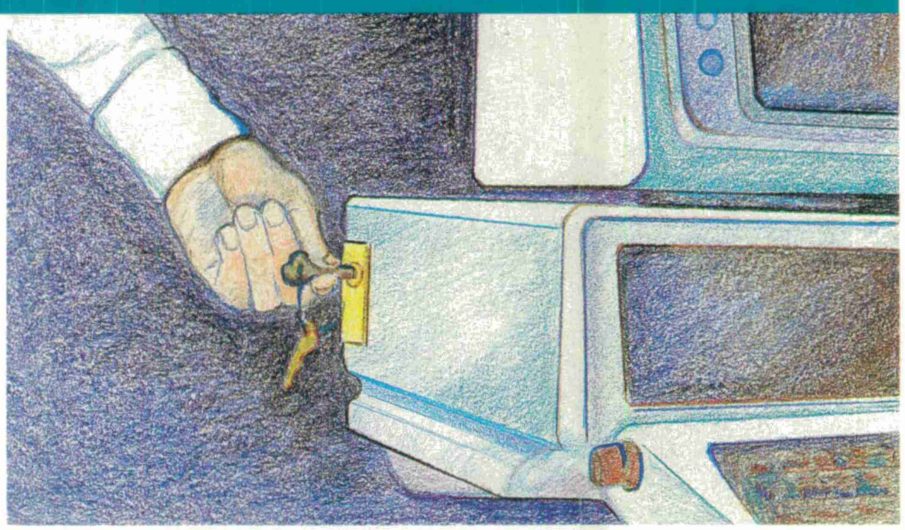
COMPUTER SECURITY

(Project 2239)

. . . develops and transitions computer security tools, techniques, and validation procedures for use in both Air Force and DoD Mission Critical and Automatic Data Processing computer systems. Emphasis is on security as it relates to the processing and storage of computer data.

Trusted

Certification



Accreditation

Proven

TODAY

Documented guidance on how to conduct formal security verifications on Air Force computer systems.

Automated Tool and Technique for analyzing the security risk associated with a given computer system configuration.

Advanced videotape tutorials on computer security state-of-the-practice, and currently emerging technologies.

TOMORROW

Implementation of the first multiple security level database management system.

Computerized Tool and Methodology for software engineers to design security features into computer databases.

First Air Force implementation of a Local Area Network (LAN) to provide verifiably secure transmission and processing of computer data.

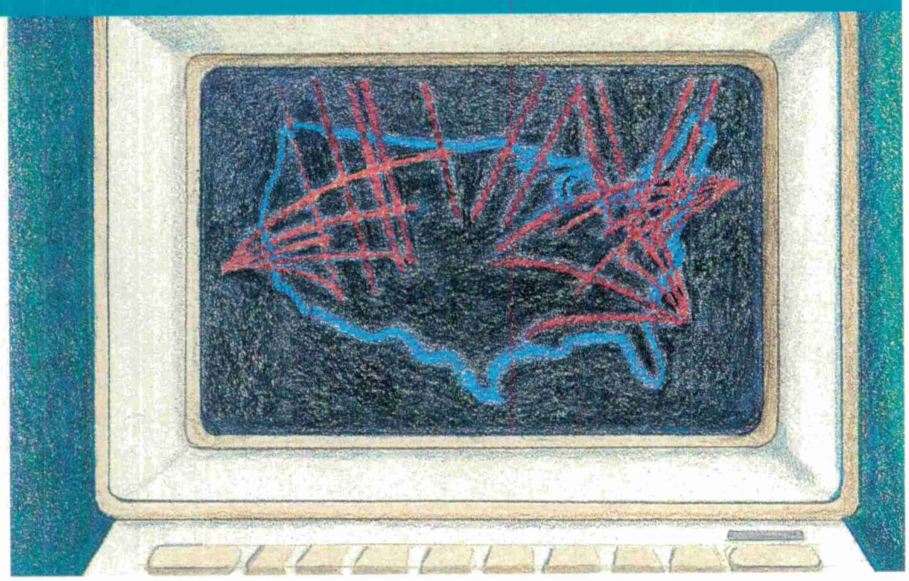
REQUIREMENTS ANALYSIS (Project 2522)

Simulate

Conceptual Design

Trade-Offs

. . . develops, transitions, and initially applies tools and techniques that provide insight into the technical performance, schedule, cost and high-risk implications of stated computer resource system requirements. Emphasis is on identifying and specifying requirements during the conceptual phase of a mission critical system acquisition.



Prototype

TODAY

Computerized engineering tools for modeling conceptual system design, simulating system performance, and validating proposed architectures.

Comprehensive human factors engineering guidelines for designing efficient and consistent man-computer interfaces.

Prototype Tool and Methodology for designing accurate, reliable and cost efficient computer databases..

TOMORROW

State-of-the-art computer color graphics simulator for real-time prototyping of man-machine computer interfaces.

Advanced automated tools for developing software systems from requirements inception to final written code.

Electronic Tools and Techniques for generating, evaluating, and tracking system software requirements to the resultant design descriptions.

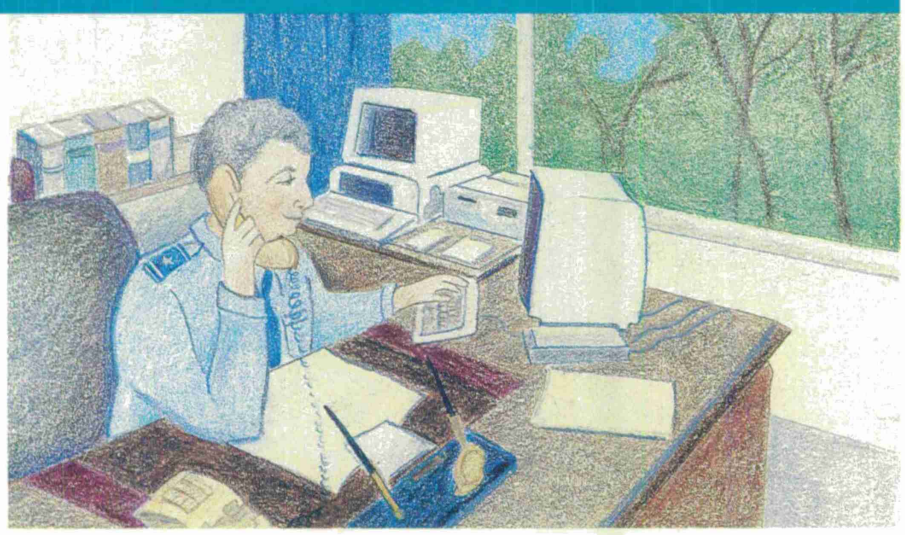
MANAGEMENT CONTROL TECHNOLOGY (Project 2523)

. . . develops, evaluates, and applies tools and methods for estimating software development costs, and defining strategies and practices that help control mission critical system acquisitions. Emphasis is on improving software identification, control, configuration, and status accounting.

Measurement

Cost

Standards



TODAY

Scientifically proven technique for cradle to grave quality measurement of mission critical computer software.

First ever DoD sanctioned standards for acquiring quality mission critical computer software.

Comprehensive catalog of Automated Tools that support the development and maintenance of weapon system software written in the Ada and JOVIAL High Order Languages.

TOMORROW

Automated Tool to provide quick and accurate computer software size estimates for software intensive weapon systems.

Integrated set of computerized tools and methods for improving management visibility and control over the software acquisition process.

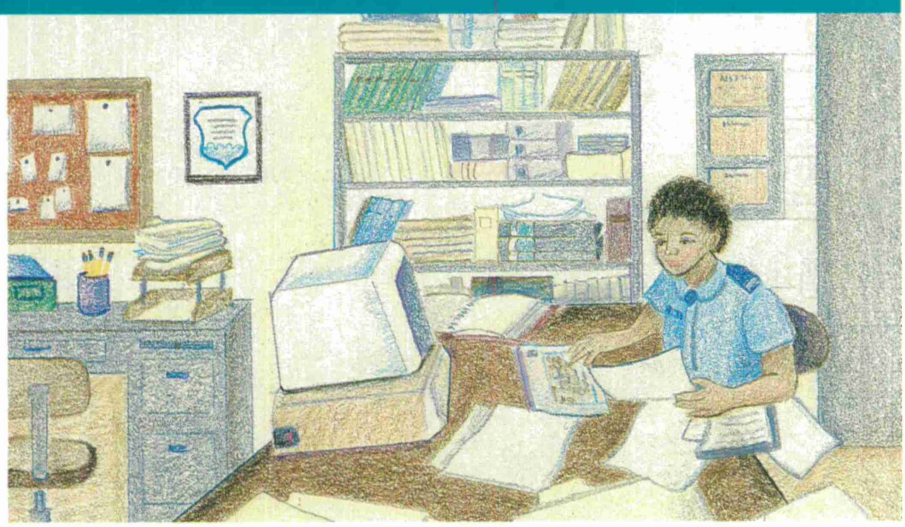
Management Plan and Software Tools for all DoD standards used to acquire, develop and support Mission Critical Computer Resources.

POLICY AND PROCEDURE GUIDANCE (Project 2524)

. . . develops and transitions techniques and products that support the initial training and continued proficiency of Air Force personnel in mission critical software acquisition management. Emphasis is on guidance that leads to significant improvements in the acquisition and support of software intensive mission critical systems.

Proficiency

Training



Information Access

People

TODAY

Revolutionary Methodology for developing computerized instruction from existing system documentation.

Documented guidance for evaluating flight critical system software for survivability and dependability.

Training methodology to support three complementary levels of instruction: classroom presentation, computer aided instruction, and work-area access of automated information.

TOMORROW

Paperless, automated reference library for rapid desktop computer access to volumes of published acquisition data.

Micro-computer based Air Force standard Instructional Support System to provide both Computer Managed Instruction and Training capability.

Validated criteria to assess the adequacy of software product specifications and test plans against original system requirements.

SOFTWARE ENGINEERING TOOLS AND METHODS (Project 2526)

. . . develops and transitions advanced, integrated engineering tools and techniques to improve the software development and support process. Emphasis is on the introduction of Ada, the standard DoD Higher Order Language, into active Air Force use, and the transition of Artificial Intelligence techniques into the software engineering and development process.

Development

Ada

Artificial Intelligence

TODAY

Extensive Program Manager guidance on potential cost, schedule, and performance risks in using Ada for a major weapon system acquisition.

Revolutionary technique for conveying Ada constructs and concepts using structured, graphical pictographs.

Documented Lessons Learned for a 30,000 statement Ada coded development in a microcomputer environment.

TOMORROW

State-of-the-Art Software Tool to assist users in the timely identification, location, and retrieval of data from computer databases.

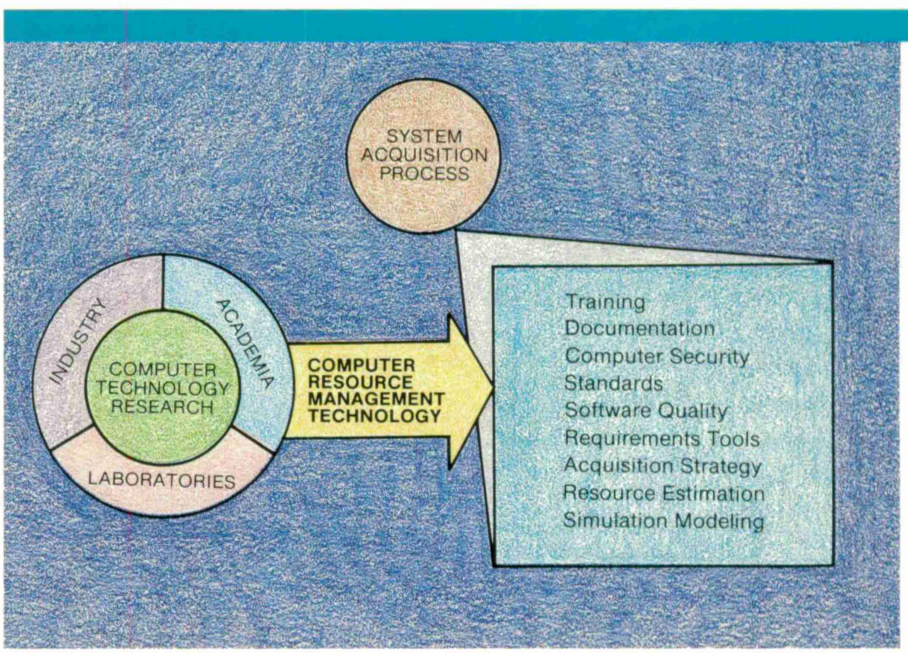
Intelligent computer maintenance aid for expert diagnosis of missile fault data.

Detailed guidance on the production quality and reusability features of Ada compilers, and performance characteristics in real-time processing applications.

SUMMARY

The use of computer processors and software within Air Force weapon systems is expanding exponentially. Since 1983, the number of computers in the inventory has more than doubled. In addition, three quarters of all current and planned weapon system acquisitions have significant computer hardware and software requirements. By 1990, the annual cost for developing and maintaining the computer software associated with these systems is estimated to exceed $30 billion, or about 10% of the nation's defense budget.

The **Computer Resource Management Technology Program** (PE 64740F) is the sole Air Force engineering development program which focuses on the problems associated with the acquisition and support of computer resources within mission critical weapon systems. Engineering development is the final development and test of an operationally, technically, and economically desirable product as a solution to a problem or technical objective. As the diagram below indicates, this program serves as the primary Air Force vehicle for transitioning into operational use the computer technology of advanced development work accomplished in industry, universities, and Air Force laboratories. This technology transition role is specifically oriented toward the application of products which increase the management control, security, quality, and performance of mission critical computer resources within Air Force weapon systems.

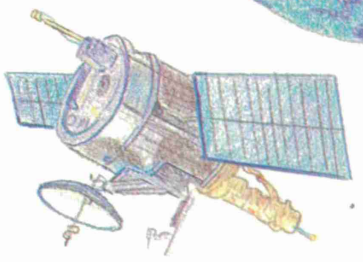


This brochure presents an overview of the **Computer Resource Management Technology Program** and each of its five projects:

- **Computer Security** ..... **(Project 2239)**
- **Requirements Analysis** ..... **(Project 2522)**
- **Management Control Technology** ..... **(Project 2523)**
- **Policy and Procedure Guidance** ..... **(Project 2524)**
- **Software Engineering Tools & Methods** .... **(Project 2526)**

For additional information on the products or activities of this program, contact the program office at Autovon 478-2106 or commercial 617-377-2106.

REPRESENTATIVE PROGRAM CUSTOMERS



Headquarters Strategic Air Command (SAC)
Strategic War Planning Systems Project
Offutt AFB, Nebraska

Pacific Air Command Air Force (PACAF)
Korean Air Intelligence System
Hickam AFB, Hawaii

Army Combined Arms Developments Activity
Underwater Communications Project
Fort Leavenworth, Kansas

Defense Communications Agency (DCA)
Eucom Theater Communications Architecture Project
Washington D.C.

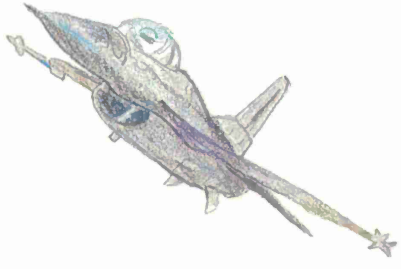
National Aeronautics and Space Administration (NASA)
Space Station Information System Project
Goddard Space Flight Center, Maryland

Headquarters Air Force Flight Test Center
Argus, Management and Resource Information System
Edwards AFB, California

Headquarters Aeronautical Systems Division (ASD)
Precision Location Strike System
Wright-Patterson AFB, Ohio

Headquarters Space Division (SD)
Milstar Satellite Communications Project
Los Angeles AFS, California

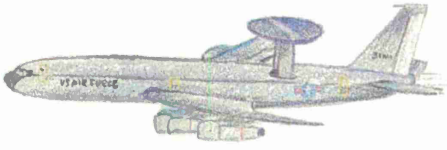
Air Force Human Resources Laboratory
Advanced on-the-Job Training System
Bergstrom AFB, Texas



Headquarters Military Airlift Command (MAC)
Secure Database Management Study
Scott AFB, Illinois

Air University
Air Force Wargaming Project
Maxwell AFB, Alabama

Naval Underwater Systems Center
SSN Architectural Modeling Project
Newport, Rhode Island



National Security Agency (NSA)
Future Secure Voice System Terminal
Fort George G. Meade, Maryland

6575th School Squadron
SAS, Computer Resource Acquisition Course
Brooks AFB, Texas

Headquarters Armament Division (AD)
Global Positioning System Range Application
Eglin AFB, Florida

Headquarters Air Force Contract Management Division (AFCMD)
Plant Representative Training Program
Kirtland AFB, New Mexico

Headquarters Rome Air Development Center (RADC)
Advanced Onboard Signal Processor
Griffiss AFB, New York

Supreme Headquarters Allied Powers Europe (SHAPE) Technical Center
Allied Command Europe Future Command & Control Project
The Hague, Netherlands

Air Force Systems Command
Mission Critical Computer Resources Standardization Project
Andrews AFB, Maryland

Air Force Computer Security Center
Risk Analysis Standardization Project
Kelly AFB, Texas

Organization of the Joint Chiefs of Staff (JCS)
Joint Operations Analysis Project
The Pentagon, Washington D.C.

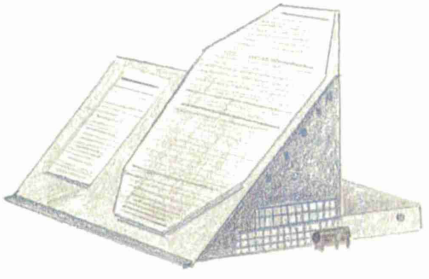
National Computer Security Center (NCSC)
Security Product Evaluations Project
Fort George G. Meade, Maryland

Air Force Operational Test and Evaluation Center (AFOTEC)
Consolidated Space Operations Project
Kirtland AFB, New Mexico

Headquarters Electronic Systems Division
Peace Shield Architectural Design Analysis
Hanscom AFB, Massachusetts

Headquarters Aerospace Medical Division (AMD)
Advanced Training System Project
Brooks AFB, Texas

Command and Control Systems Office
Standard ADA Remote Autodin Host Project
Tinker AFB, Oklahoma



COMPUTER RESOURCE MANAGEMENT TECHNOLOGY PROGRAM
ESD/XRS, Hanscom AFB, Massachusetts 01731

For additional information on the program's products
or activities, contact the program office at Autovon
478-2106 or commercial 617-377-2106.